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SOME OF THE SYRUPS OF THE U. S. PHARMACOPŒIA AND NATIONAL FORMULARY.*

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During the past year the writers have been engaged upon a series of experiments upon some of the official syrups, and while our work on several is not yet completed it is deemed advisable to present and record a number of the results already obtained. These investigations were undertaken with several points in view.

First, to critically examine the formulas now official and the products of the same.

Second, to see if these could not be simplified and improved upon and formulas established by which the pharmacist can prepare all of his syrups in his own store, preferably direct from the drugs, without being dependent upon manufacturers. If one examines the foreign Pharmacopœias he will see how this point is continuously in mind. Under the existing laws the pharmacist is made responsible for the purity of the products he dispenses. The first effect of the food and drug laws has been largely to the benefit of the manufacturers, because a large number of the druggists of the country were not prepared to carry out the official processes of manufacture and assay and these have adopted a system of purchasing assayed fluidextracts, tinctures, etc., in place of preparing them themselves. The pharmacists must awaken to the fact that

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this method will not protect them in the numerous sales in broken packages which they make, and must prepare themselves to assume the full measure of responsibility imposed by the laws. The Pharmacopœia and National Formulary should give particular attention in the formulas to their needs and legal responsibility.

Third, to determine if the use of fluidextracts in the preparation of syrups cannot be eliminated. The use of fluidextracts introduces into these two sources of annoyance and imperfection. The alcoholic menstruum extracts from the drugs certain resinous or extractive matters which sooner or later form some deposit in the syrups, and the small amount of alcohol usually introduced by their use only serves to encourage fermentation.

Fourth, experiments upon the extraction of numerous drugs with glycerin-water menstruums in the course of experiments upon the fluidglycerates [1] proved that many drugs can be so extracted without the use of any alcohol, and we wished to determine how far this method could be made available in the preparation of syrups. Glycerin has an inhibitive action upon several forms of decomposition that syrups are prone to undergo; this has already been taken advantage of to a moderate extent in our own Pharmacopœia which directs its use in several syrups, and the recent revision of the Pharmacopœia Helvetica, 1907, extends the idea and directs it in the following syrups: adianti, menthæ, picis cum codeino, ratanhiæ, sarsaparilla compositus, turionis pini, and senegæ. In the senega formula this Pharmacopœia, by a roundabout process, actually prepares the fluidglycerate of senega which is then diluted 10 parts to 90 of syrup. Attention was called to the preservative value of glycerin in solution and syrup of ferrous iodide forty years ago in a note by R. Lewellen.[2]

A number of manufacturers learned that it appeared to prevent the caramelization as well as other chemical changes in such syrups as syrup of hydriodic acid and hypophosphites, and they have been taking advantage of this and have increased the stability of their products by displacing part of the sugar with glycerin. Our experiments demonstrate to our satisfaction that the addition of even 50 c.c. of glycerin to a litre of syrup of hypophosphites or compound

[1] Proceedings Amer. Ph. Assn., 981. AMER. JOURNAL PHARMACY, 1908, 525.

[2] AMER. JOURNAL PHARMACY, 1868, 108.

syrup of hypophosphites made these clear and permanent for at least a year. We suggest that in the syrup of hypophosphites and the compound syrup of the hypophosphites that the Pharmacopœia directs its addition to the extent of not more than 100 c.c. in a litre.

Incidentally in these experiments we have tried some of the suggestions of other writers and these may be referred to in the comments and reports on the individual syrups. The formulas offered are the results of many experiments; the details of those unsatisfactory, as a rule, are omitted.

SYRUPUS AMYGDALÆ U.S.P.—The U.S.P. VIII has discarded the formula for syrup of almonds made from an emulsion of almonds, although this method is still retained in the foreign Pharmacopœias. The present formula is simply a very dilute bitter almond and orange flower syrup and will not keep indefinitely. The small amount of spirit of bitter almond directed is insufficient to act as a preservative and is itself soon oxidized. We recommend in this syrup that the spirit of bitter almond be increased to 20 c.c. in the litre and that stronger orange flower water be used, also that extemporaneous preparation be directed.

SYRUPUS AURANTII U.S.P.—The present official method is destructive of the fine aroma of the tincture of sweet orange peel and leaves with the magnesium carbonate a large proportion of the flavor. We recommend the following as an improvement, retaining all of the flavor of the tincture and not exposing this to oxidation.

Tincture of sweet orange peel	50 c.c.
Citric acid	5 Gms.
Glycerin	100 c.c.
Syrup, a sufficient quantity to make	1000 c.c.

Dissolve the citric acid in 500 c.c. of syrup mixed with the glycerin. Gradually add the tincture of sweet orange peel, shaking after each addition, then add sufficient syrup to make 1000 c.c. The improvement in flavor over the present U.S.P. formula is marked and the opalescence is scarcely perceptible.

SYRUPUS AURANTII FLORUM U.S.P.—Stronger orange flower water should be directed in this formula.

SYRUPUS IPECACUANHÆ U.S.P.—This syrup can be very readily prepared direct from the powdered drug without any deviation of the official strength or ingredients. The following is the improved formula proposed:

Powdered ipecac	70 Gms.
Acetic acid	10 c.c.
Glycerin	100 c.c.
Sugar	750 Gms.
Water, a sufficient quantity.	

Percolate the ipecac with a mixture of the acetic acid, glycerin, and 290 c.c. of water, and then continue the percolation with water till 600 c.c. of percolate is obtained. In this dissolve the sugar, add sufficient water to make the product measure 1000 c.c.

SYRUPUS KRAMERIÆ U.S.P.—The official formula illustrates the use of fluidextracts to the limit and despite the relatively large amount of alcohol present does not keep well. E. Fullerton Cook [3] characterizes "this syrup as pharmaceutically unsatisfactory. . . . When the fluidextract and syrup are mixed, a coagulated mass, almost too thick to pour, results. As this syrup stands it separates into two layers, a clear, dark-reddish liquid above, and a cloudy portion occupying about three-fourths of the bottle with a heavy precipitate at the bottom."

For this we submit the following formulas:

Krameria (No. 20 powder)	450 Gms.
Glycerin	225 c.c.
Sugar	650 Gms.
Water, a sufficient quantity.	

Mix the glycerin with 675 c.c. of water and percolate the krameria with this mixture, and then continue percolation with water till the drug is extracted, evaporate the percolate to 650 c.c., and in this while still warm dissolve the sugar. Strain the liquid and add sufficient distilled water to make 1000 c.c. of product.

As an alternative formula:

Fluidglycerate of krameria	450 c.c.
Syrup	550 c.c.
Mix.	

Either of these formulas yields a clear liquid which keeps fairly well without gelatinizing or precipitating.

SYRUPUS LACTUCARII U.S.P.—To obtain a pharmaceutically satisfactory product by the official method requires a perfect tincture of lactucarium. The latter is difficult to prepare, and not infrequently

[3] Proceedings Amer. Phar. Assn., 1908, p. 960.

the operator will have to exercise some judgment in modifying the manipulations of the official process. The petroleum benzin directed must be *purified* and free from objectionable heavy and odorous substances or the product will persistently retain traces of a disagreeable and perceptible taste thereof. It is not always possible to obtain lactucarium that will permit of treatment on a filter as directed, and for this reason we have used a percolator and a largely increased amount of benzin until the drug is thoroughly extracted.

The syrup of lactucarium has proved to be a pharmaceutical bugbear and the unsatisfactory character of the preparation dispensed is largely to blame for the discredit of the remedy and its gradual disuse.

When we look over the literature on this subject we are surprised at the number of essays on this preparation, the various solvents and extractions proposed. Benzin, ether, alcohol, alkalies, have been applied while we have all closed our eyes to the lesson that nature has taught and the way she so plainly indicates. In the laticiferous vessels of the lactuca the substance subsequently obtained as lactucarium is associated with a number of secretion substances in an aqueous solution indicating that water alone is necessary for its solution.

Then why is it necessary for the pharmacist to bother about extracting the inert and useless substances associated with the drug? Why complicate the problem by preliminary extraction or the use of solvents which introduce inert substances and precipitates in the product? Why not select a solvent at once that will extract the desired constituents and leave the undesirable unacted on? Reasoning along this line our experiments led us to the following formula which appears to yield a very satisfactory product, miscible with other syrups or water or hydroalcoholic liquids, and keeping well and is submitted as a decided improvement.

Lactucarium	50 Gms.
Glycerin	250 c.c.
Sugar	600 Gms.
Stronger orange flower water	100 c.c.
Distilled water, a sufficient quantity.	

Beat up the lactucarium with 400 Gms. of clean sand or 200 Gms. of pumice to coarse powder and place in a percolator, shaking down evenly but not packing, pour on sufficient of a mixture of the

glycerin, orange flower water, and 300 c.c. of distilled water to saturate and leave a layer above. Then cork up the percolator and cover and macerate for two days. Then percolate slowly, using the remainder of the mixture and then distilled water till 700 c.c. of percolate is obtained; in this dissolve the sugar, using a water bath heat if necessary, and strain, make up the product to 1000 c.c. with distilled water.

SYRUPUS PRUNI VIRGINIANÆ U.S.P.—Each of the writers has independently made up samples of this syrup by the method of U.S.P., 1890, and by the present official method. One has moistened the wild cherry and packed it at once in a percolator and then added sufficient water to leave a layer above, tightly covered and corked up the percolator, macerated for twenty-four hours before continuing the process. The other has followed the direction of the U.S.P. to pack in percolator twenty-four hours after moistening. Determinations made showed that the process of U.S.P., 1890, yielded the greater amount of astringent principle, but that the syrups made U.S.P., VIII, contained a greater percentage of hydrocyanic acid, and from this we concluded that the presence of glycerin in the menstruum exerted an inhibitive action on its generation. The experiment with immediate packing and a layer of water as above stated gave a higher percentage of hydrocyanic acid. In no case does the amount of hydrocyanic acid present in the syrup compare favorably with that shown to be present in the bark by direct distillation and determination. It is apparent that the bark is not entirely exhausted and we propose to make further investigations to determine the percentage of such extraction and amount left in the marc, and at a later date will record the analytical data.

Our experiments warrant, however, the following recommendations: That the present official method be modified to direct that the moistened powder be packed and macerated in the percolator for twenty-four hours with sufficient water to keep it submerged, and that the percolation be then continued until the liquid in the receiving vessel containing the glycerin measures at least 600 c.c. It is to be noted in this connection that in U.S.P., VIII, an error in this formula has inadvertently crept in. The 1890 Pharmacopœia percolated with a menstruum containing 150 c.c. of glycerin until 450 c.c. of percolate was obtained. The present official directions are that the percolation with water be continued until the liquid in the receiving bottle measures 450 c.c. As 150 c.c. of glycerin is

first placed in this bottle it is obvious that but 300 c.c. of percolate would be obtained and this is not sufficient to extract the drug.

SYRUPUS RHEI U.S.P.—There is no need for the use of the fluidextract of rhubarb in this formula, as a syrup can very readily be prepared from the drug. The following formula is entirely satisfactory:

Rhubarb (No. 20 powder)	100 Gms.
Potassium carbonate	10 Gms.
Glycerin	50 c.c.
Sugar	800 Gms.
Cinnamon water, a sufficient quantity.	

Mix the rhubarb [4] with 250 grammes of clean sand and moisten with 50 c.c. of a mixture of the glycerin and 150 c.c. of cinnamon water, transfer to a percolator, and extract using the remainder of the menstruum and then cinnamon water till 600 c.c. of percolate is obtained. To this add the potassium carbonate and then the sugar, using a water-bath heat to dissolve, and strain and add cinnamon water, if necessary, to obtain 1000 c.c. of product.

SYRUPUS ROSÆ U.S.P.—In this formula 10 c.c. of diluted sulphuric acid is added to the fluidextract in order to fix the color. In most of the samples of fluidextract of rose, U.S.P., that we have seen the color is decidedly off and obviously for this purpose the acid should be added to the menstruum in the preparation of the fluidextract. The following is submitted as a rational process for direct preparation of syrup of rose:

Rose leaves in fine powder	125 Gms.
Diluted sulphuric acid	10 c.c.
Glycerin	100 c.c.
Sugar	800 Gms.
Water, a sufficient quantity.	

Mix the powdered rose leaves with 500 Gms. clean pure sand [5] and moisten this with sufficient of the menstruum composed of the diluted sulphuric acid and glycerin and 500 c.c. of water, pack *lightly* in a percolator, macerate for one hour, and then continue the

[4] It is not advisable to use finer powdered rhubarb than No. 20 or a much larger amount of sand will be necessary.

[5] For these experiments cleanest commercial sand obtainable was boiled with diluted hydrochloric acid and then washed with water till no precipitate with silver nitrate T.S. was obtained.

percolation slowly, using first the balance of the menstruum and then water till 600 c.c. of percolate is obtained. Dissolve the sugar in this by heat of water-bath, if necessary, strain, and add sufficient water to obtain 1000 c.c. of product.

SYRUPUS RUBI U.S.P.—This drug is easily extracted by glycerin, and as a substitute for the present unsatisfactory formula the following is submitted:

Rubus, in No. 20 powder	250 Gms.
Glycerin	125 c.c.
Sugar	800 Gms.
Water, a sufficient quantity.	

Mix the glycerin with 375 c.c. of water and percolate the drug with this menstruum, and then continue with water until 600 c.c. of percolate is obtained. Dissolve the sugar in this by warming. Strain when cold and add sufficient water to obtain 1000 c.c. of product.

As an alternative formula:

Fluidglycerate of rubus	250 c.c.
Syrup	750 c.c.
Mix.	

SYRUPUS SARSAPARILLÆ COMPOSITUS U.S.P.—Any one who has followed the official instructions for the preparation of this syrup must have noted the decided precipitate produced on diluting the fluidextracts with water. A pharmacist likewise is impressed with the impropriety of adding the oils to the fluidextracts before dilution, and it is self-evident to any one examining the filter that a good proportion of the flavoring is retained by the precipitate.

Our experiments had demonstrated that glycerol-water menstruum would satisfactorily extract both sarsaparilla [6] and licorice root, and while senna by itself could not be percolated with this menstruum, when mixed with the other ingredients in the proportion used in this syrup there was no difficulty in percolation. The sample submitted is made by the following formula:

[6] Fluidglycerate of sarsaparilla and fluidextract of sarsaparilla were prepared from the same lot of drug, at the same time, and have been kept under the same conditions. The former shows little or no precipitation, while the latter exhibits a decided deposit, and the decanted fluidextract is not equal to the fluidglycerate in the peculiar aroma and acridity of the drug.

Sarsaparilla (No. 20 powder)	200 Gms.
Glycyrrhiza (No. 20 powder)	15 Gms.
Senna (No. 20 powder)	15 Gms.
Glycerin	125 c.c.
Sugar	750 Gms.
Oil of sassafras	0.2 c.c.
Oil of anise	0.2 c.c.
Oil of sweet birch	0.2 c.c.
Water, a sufficient quantity.	

Add the glycerin to 375 c.c. of water, and, having thoroughly mixed the ground drugs, moisten with 225 c.c. of this menstruum and pack in a percolator. Allow to macerate for six hours, then percolate, using the remainder of the menstruum, and then water till 600 c.c. of percolate is obtained. In this dissolve the sugar by heat. Allow to cool, strain, add the oils, thoroughly incorporate by agitation, and then add sufficient water to obtain 1000 c.c. of product.

SYRUPUS SCILLÆ COMPOSITUS U.S.P.—In order to critically test this official formula, samples of fluidextracts of squill and fluidextract of senega were prepared strictly in accordance with the U.S.P.

The object of evaporating the mixed extracts is probably to coagulate the albumin as well as to remove both alcohol and the part of the acetic acid that is not fixed as potassium acetate, but this can be accomplished only in part and only after a prolonged heating. The filtration of the extracts diluted with water, using talcum as a clarifying agent, is tedious and unsatisfactory. To prepare a litre required four days for this preliminary operation. The finished product is not satisfactory and soon after preparation precipitation starts and continues to increase.

The following formula is the result of our experiments:

Squill (No. 20 powder)	80 Gms.
Senega (No. 20 powder)	80 Gms.
Antimony and potassium tartrate	2 Gms.
Acetic acid	20 c.c.
Glycerin	100 c.c.
Sugar	700 Gms.
Water, a sufficient quantity.	

Mix the drugs and moisten with sufficient of a mixture of the glycerin, acetic acid, and 300 c.c. of water. Place loosely in a percolator, cover, and allow to macerate for twenty-four hours. Then shake down so as to pack *lightly* and proceed to percolate,

using the remainder of the menstruum and then water till exhausted. Reserve the first 500 c.c. of percolate, evaporate the remainder to 100 c.c., in which dissolve the antimony and potassium tartrate, and when cold filter into the reserve and then dissolve the sugar by agitation. Strain if necessary and add sufficient water to obtain 1000 c.c. of product.

SYRUPUS SENEGÆ U.S.P.—Neither the fluidextract of senega U.S.P. nor the syrup made therefrom has in our experience proven satisfactory. We have obtained the best results by direct extraction of the drug with ammonia as the alkali present. The formula submitted is:

Senega (No. 20 powder)	200 Gms.
Ammonia water	20 c.c.
Glycerin	100 c.c.
Sugar	750 Gms.
Water, a sufficient quantity.	

Mix the ammonia water and glycerin with 200 c.c. of water and moisten the drug with sufficient menstruum. Pack *lightly* in a percolator, macerate twenty-four hours, and then percolate into a graduated receiver in which the sugar has been placed till 800 c.c. is obtained, using first the remainder of the percolate and then water. Reserve this portion and set aside as a reserve. Continue the percolation till exhausted, evaporate this to 200 c.c. and add to the reserve, agitate till the sugar is dissolved, strain the syrup, and add sufficient water to obtain 1000 c.c. of product.

SYRUPUS GLYCYRRHIZÆ N.F.—A convenient and satisfactory formula for this is offered:

Fluidglycerate of glycyrrhiza	250 c.c.
Syrup	750 c.c.
Mix.	

It is to be observed that the N.F. reverses the process by directing that pure extract of glycyrrhiza be dissolved in water, sugar added, and then glycerin. With fluidglycerate directed an excellent preparation can be made instantly.

SYRUPUS PAPAVERIS N.F.—Solely for the preparation of this syrup a tincture of poppy is introduced made by infusion with water, concentrating, adding alcohol and glycerin. As tincture of poppy capsules is never prescribed, we fail to see the necessity for its introduction here, as the same labor of preparing the infusion and

concentrating it is but a preliminary step to the preparation of the syrup. To first prepare a tincture and then give a formula for syrup by which the alcohol is evaporated from this and then diluted with water and sugar added seems like going around Robin Hood's barn. If poppy capsules were not readily obtainable or did not keep there might be some excuse for this roundabout process. Poppy capsules are a common article of the drug market, and for making this syrup only the unripe capsules should be employed, in which the exterior is pale yellow, nearly white in color, and the seeds are white, and these should be removed. We submit a formula based on making 100 c.c. of the finished syrup represent 10 Gms. of the drug. The German Pharmacopœia directs 10 parts of the drug to be used in making 100 parts by weight of the syrup, but as the method there given does not fully extract the drug it is believed this proposed formula will yield a preparation not differing greatly in strength from the German:

Poppy capsules (unripe and deprived of seed in No. 20 powder)	100 Gms.
Sugar	800 Gms.
Water, a sufficient quantity.	

Add the poppy capsules to 1500 c.c. boiling water. Allow the infusion to stand for two hours and then express. Again infuse the dregs with 500 c.c. boiling water and after two hours express. Mix the expressed liquids and evaporate to 500 c.c. Then filter and dissolve in the filtered liquid the sugar by heat. Add sufficient water to obtain 1000 c.c. of the product and strain.

Syrupus Pini Strobi Compositus N.F.—Compound syrup of white pine has been subjected to considerable criticism, largely because it has become popular and there is a well-grounded objection to selling popular remedies containing morphine. In the Committee on Revision it has even been proposed to emasculate the preparation by cutting out the morphine. This does not impress us as practical. It would be another case of Hamlet with Hamlet omitted. It will be quite as logical to advocate that the opium be eliminated from paregoric. The proposer of this suggestion does not realize that the acceptance of this suggestion would not improve conditions because the physician would continue to prescribe and dispense a preparation containing morphine. It might mean a serious matter indeed to the druggists throughout the country who have on hand many thousand bottles made up presumably with the N.F. content.

The N.F. formula has likewise been criticized because it has changed the proportion of the drug constituents and also the menstruum used as being insufficient in alcohol. Both of these criticisms have been considered. The slight change made in the proportion of drugs from that in the preparation as originally marketed is, however, not material, and in our experiments we have confined ourselves to the drugs and active constituents in the proportions given in the N.F. The four samples submitted have been made up with different menstruums: No. 1 with a menstruum of alcohol 1 volume, water 7 volumes, strictly as directed by the N.F.; No. 2 with a menstruum of glycerin 1 volume, water 3 volumes; No. 3, first menstruum for 1 litre, was alcohol 100 c.c., glycerin 100 c.c., water 400 c.c., and percolation then continued with alcohol 1 volume, water 5 volumes; No. 4, first menstruum of alcohol 100 c.c., glycerin 100 c.c., water 200 c.c. and continuing with a mixture of alcohol, 1 volume, water 3 volumes.

It will be seen from the samples shown that Nos. 1 and 2 are perfectly clear and bright syrups, but are deficient in balsamic flavor of the balm of gilead buds and strength of the other drugs. No. 3 is clear and possesses more color and flavor of the constituents but is not equal in flavor and strength to No. 4. Consequently we are constrained to endorse No. 4 as having the proper menstruum.

To obtain a product more clearly corresponding to the best of those in the market we would recommend the addition of 1 Gm. of cudbear to the formula and 0.2 c.c. oil of sassafras to improve the flavor, the formula being as follows:

White pine bark	85 Gms.
Wild cherry	85 Gms.
Spikenard root	10 Gms.
Balm of gilead buds	10 Gms.
Sanguinaria	8 Gms.
Sassafras bark	7 Gms.
Cudbear	1 Gm.
Morphine sulphate	0.5 Gms.
Chloroform	6 c.c.
Sugar	650 Gms.
Glycerin	100 c.c.
Oil of sassafras	0.2 c.c.

Alcohol and water, of each a sufficient quantity.

Reduce the vegetable drugs to a coarse powder and thoroughly mix them. Moisten the powder with a menstruum composed of the

glycerin, 100 c.c. of alcohol, and 200 c.c. of water, pack in a percolator, and macerate for twelve hours. Then percolate, using first the remainder of the menstruum and then a mixture of alcohol 1 volume to water 3 volumes till 650 c.c. of percolate is obtained, in which dissolve the sugar and the morphine sulphate, lastly add the chloroform and oil of sassafras, agitate thoroughly, add sufficient water to obtain 1000 c.c. of product, and strain.

SYRUPUS QUINIDINÆ N.F.—The attempt here appears to have been to place before the physician a formula that would displace a proprietary syrup. The object has been defeated by making the syrup *too thin* by adding solution of saccharine and mucilage of acacia and likewise by the selection of the wrong flavoring orange flowers in place of orange. The consistence is such that the quinidine does not stay suspended even temporarily. A formula that more closely simulates the proprietary and that has given satisfaction to a number of physicians is here given.

Quinidine, selected fine crystals	33 Gms.
Oil of orange peel	0.2 c.c.
Syrup, a sufficient quantity to make	1000 c.c.

To 750 c.c. of syrup contained in suitable bottle add the oil of orange and the quinidine, shake vigorously to disseminate, and then add sufficient syrup to make 1000 c.c.

SYRUPUS RHAMNI CATHARTICÆ N.F.—Here the pharmacist has been confronted by an anomalous situation, namely, a legal standard and formula is given that he cannot follow. Fermented juice of buckthorn is directed and in a footnote we are told, "That if the fresh berries cannot be obtained, the imported fermented juice may be used in preparing the syrup." It is quite true that in Europe when the buckthorn is indigenous several of the Pharmacopœias direct the expressed juice of the *fresh ripe* berries to be fermented before making into syrup. The German and French Pharmacopœias direct that fermentation be allowed to proceed in the expressed juice until a portion filtered off mixes clear with half of its volume of alcohol and the Pharmacopœia Helvetica insures fermentation by the addition of a small amount of sugar and some compressed yeast.

But as buckthorn is grown only infrequently in the United States as a shrub, supplies of fresh berries are not available to the American pharmacist and so he cannot prepare the juice. We have

endeavored to obtain the imported fermented juice and have corresponded in the search with the largest drug importers in New York and Philadelphia. The following abstracts from their replies wil' prove that fermented juice of buckthorn berries is *not now* an article of commerce in this country, *if it ever was:*

"We have none in hand and do not know where we can obtain it."

"We are unable to supply the article."

"We regret the necessity of advising that we are unable to furnish fermented juice of buckthorn berries nor are we able to inform you where this product can be obtained."

"We have none ourselves nor could we learn anything regarding it from any of the other dealers in our city." This from a very large New York firm.

"After careful inquiry we have been unable to find fermented juice of buckthorn berries."

"We have no article of this kind, neither is it commercially obtainable. We have received orders for it repeatedly but have never been able to obtain a 'fermented juice of buckthorn.'"

"There is not attainable in this country a fermented juice of buckthorn berries either of domestic or foreign preparation."

"There is no imported fermented juice (as referred to in the N.F.)."

This evidence was so convincing that we were compelled to give up the search for the juice and conclude that it was impossible to follow the N.F. in this syrup and that a change in the formula was absolutely necessary. Many of the pharmaceutical manufacturers supply a fluidextract of buckthorn berries and on their labels give formulas for preparing the syrup therefrom. Consequently, we concluded that the berries must be an article of commerce and have learned that they grow extensively in Germany, Austria, Hungary, and Northern Italy. Both the ripe and unripe berries are imported. The latter are brownish-green in color and quite bitter in taste and are used as a dyeing material. For pharmaceutical purposes only the mature ripe and carefully dried fruit are serviceable and these are sufficiently an article of commerce to be made official, as ample supplies are available from the foreign source, but the description should carefully discriminate against the use of immature or unripe berries.

Having secured an ample supply of the ripe berries the writers

experimented on formulas for the various pharmaceutical preparations. It was found that fluidextract could be prepared by either of the two following methods:

Ground buckthorn berries	1000 Gms.
Alcohol	250 Gms.
Water, a sufficient quantity.	

Add the ground buckthorn berries to five litres boiling water, allow to infuse for two hours and then express. Again infuse the dregs with three litres of boiling water and express. Mix the expressed liquids and evaporate to 750 c.c. When cold add 250 c.c. alcohol and allow to stand for a few days, then filter, and wash the filter with sufficient of a mixture of alcohol 1 volume, water 3 volumes, to make 1000 c.c. Or a very satisfactory fluidextract can also be prepared by the official method, using diluted alcohol as the menstruum and reserving the first 850 c.c. of percolate to each litre of product. Percolation with weaker alcohol was not practical owing to the gummy character of the drug.

Fluidglycerate of buckthorn can be prepared by the type process,[7] but the percolation is very slow and tedious.

Syrup of Buckthorn.—Several methods were tried for the making of the syrup—infusion, percolation with glycerin and water, fluidextract diluted with syrup, and fluidglycerate diluted with syrup. All of these yielded apparently good results. Buckthorn berries are apt to produce griping, and to prevent this an aromatic is usually associated as a corrective. In the formula submitted oil of fennel and oil of cassia are used for this purpose.

The following formula is recommended for the revision of the National Formulary:

Buckthorn berries, ground	200 Gms.
Sugar	800 Gms.
Oil of fennel	.2 c.c.
Oil of cassia	.2 c.c.
Water, a sufficient quantity.	

Add the ground buckthorn berries to two litres of boiling water, infuse for two hours, and then express. Infuse the dregs with 500 c.c. boiling water and express when cold. Mix the expressed liquids,

[7] See Proceedings A. Ph. A., 1908, p. 981. Amer. Jour. Pharm., 1908, p. 525.

filter, and evaporate to 600 c.c.; in this dissolve the sugar by heat and when cold strain, add the oils, and make up to 1000 c.c. with water.

As an alternative formula:

Fluidextract buckthorn berries	200 c.c.
Oil of fennel	.2 c.c.
Oil of cassia	.2 c.c.

Syrup, sufficient quantity to make 1000 c.c.
Mix.

THE USE OF THE CENTRIFUGE IN THE ASSAY OF VOLATILE OILS.

By Frank X. Moerk.

In a paper presented to the American Pharmaceutical Association at the 1908 meeting, the suggestion was made that the assays of some of the volatile oils could be more conveniently and accurately made by the use of the centrifuge than by the official method of shaking the oils with reagents in a flask or burette, for the reason that in the latter method it is almost impossible to prevent adhesion of the oil to the container.

The centrifuge has been in use as a laboratory apparatus since about 1889, when it was first applied in rapidly determining the fat content of milk and cream.

A. S. Mitchell in the *Journal of the Am. Chem. Society,* 1889, page 1132, proposed a centrifugal method for determining lemon oil in lemon extracts; and C. D. Howard in the same journal, 1908, page 608, recommended the addition of a small quantity of chloroform to assist in the centrifugal separation of oils from flavoring extracts. J. Hortvet and R. M. West in the *Journ. Industr. and Engineer. Chemistry,* 1909, page 84, published a very valuable paper upon the analysis of flavoring extracts in which, after a critical study of the subject, the centrifuge is recommended for certain extracts. The above suggestion, therefore, appears to be original for the examination of volatile oils for their characteristic constituents.

From the U.S.P. assays the method using the centrifuge appeared to be most applicable in the assay of the oils of cloves, pimenta,

thyme, cinnamon, and turpentine; in the first three phenolic components are removed by shaking with alkalies, in the fourth the aldehydic constituent is removed by shaking with sodium bisulphite, and in the last the terpene is removed by agitating with concentrated sulphuric acid.

As in all cases where graduated apparatus is used, it becomes necessary to verify the capacity and the graduation of the bottles used for centrifugal work. The Babcock milk and cream bottles are so graduated that with an initial weight of 18 grammes the graduations give at once percentage by weight of the fat, therefore it is not to be expected that the divisions of the graduated part will represent simple fractional parts of a cubic centimetre. The milk bottles were found to hold 48.8 c.c. up to the graduated neck, the latter 2.32 c.c. from 0–10 with divisions into fifths, therefore the fifty divisions equal 2.32 c.c. or one division equals 0.046 c.c. The cream bottles were found to hold 46.4 c.c. up to the graduated neck, the latter 7.82 c.c. from 0–40 with divisions into halves, therefore the eighty divisions equal 7.82 c.c. or one division equals 0.09775 c.c.

Hortvet and West describe two forms of graduated bottles, having a capacity of 150 c.c. to the graduated part, the latter 5 c.c. divided into 100 divisions, so that with an initial volume of 50 c.c. each division will indicate 0.1 per cent. by volume. One of these forms is used for oils lighter than water or the employed reagents, the other for oils heavier than water or the employed reagents. The bottles cannot be used with the ordinary Babcock apparatus, but are used with the Bausch and Lomb precision centrifuge.

The following experiments were made using the Babcock cream bottles and calculating the undissolved oil to volume percentage.

Oils of Cloves, Pimenta, and Thyme.—Mix the carefully measured oil with 30–35 c.c. alkali solution, cork the bottle, shake thoroughly for several minutes, add sufficient alkali solution to bring the mixture well up into the graduated part, cork and whirl in the centrifuge until the insoluble oil separates as a clear layer (3 to 10 minutes, 800–1000 revolutions per minute).

In some of the first experiments, the bottles were not corked while in the centrifuge and more or less discrepant results were obtained, but after corking the bottles remarkably constant results followed.

Oil of Cassia.—The U.S.P. method of using solution of sodium bisulphite was unsatisfactory as an emulsified portion separated

below the insoluble oil constituent, making the reading of the latter almost impossible.

By using a saturated sodium sulphite solution in presence of a few drops of phenolphthalein indicator and neutralizing the liberated

Oil.	C.c. taken.	Reagent.	Undissolved Oil.		Volume Per Cent.		Vol. Per Cent. by U. S. P. Process.
			Divisions.	C.c.	Insoluble Oil	Phenols.	
Pimenta	4.9	10% KOH	8	0.782	15.9	84.1	82.
	4.9	10% KOH	8	0.782	15.9	84.1	...
Cloves	4.9	10% KOH	7	0.68425	13.9	86.1	84.
	9.8	10% KOH	14	1.3685	13.9	86.1	...
Thyme	4.9	10% KOH	44	4.301	87.7	12.3	11.
	4.9	10% KOH	44	4.301	87.7	12.3	...
	4.9	10% NaOH	44	4.301	87.7	12.3	...

sodium hydroxide with acetic acid (36 per cent.), much better results were obtained although the insoluble oil was dark and viscid.

The process adopted after numerous experiments was as follows: Mix the carefully measured oil with an equal volume of oil of turpentine, add 30 c.c. saturated solution of sodium sulphite, cork bottle, warm in water-bath for 10–15 minutes, agitate repeatedly, acidify with acetic acid (36 per cent.), add sufficient sodium sulphite solution to bring the mixture well up into the graduated part, cork bottle, whirl until the insoluble oil separates as a clear layer, cool, and read off volume of insoluble oil. Make a blank test with the same volume of oil of turpentine and take the difference in reading between the two tests.

Oil.	C.c. taken.	Undissolved Oils.				Volume Per Cent.		Vol. Per Cent. by U. S. P. Process.
		Mixture Divisions	Blank Divisions	Cassia Divisions	C.c.	Insoluble Oil.	Aldehyde	
Turpentine	2 c.c.	....	20.5	..	.....	.....	.....	.....
	3 c.c.	....	30.5	..	.....	.....	.....	.....
Cassia-Turpentine	2 c.c. each	24.5	20.5	4.	0.391	19.55	80.45	about 75
Cassia-Turpentine	3 c.c. each	36.5	30.5	6.	0.5865	19.55	80.45	about 75

Experiments are now under way to determine if other volatile oils can be determined by the aid of the centrifuge.

CHEMICAL EXAMINATION OF A SAMPLE OF URINE CONTAINING PENTOSE.

By Charles H. La Wall.

The urine, which had a specific gravity of 1.020 and a yellow color, first attracted attention by the abnormal reaction produced when heated with Fehling's solution, which was not reduced to copper oxide, as is the case when the ordinary carbohydrates are present, but which produced a characteristic greenish turbidity and eventually a yellow precipitate. The fermentation test gave negative results, while a pronounced reduction was obtained by means of Boettger's test with bismuth subnitrate and solution of potassium hydroxide. A more extended examination therefore seemed desirable and about a pint of the urine was furnished, with a request for an exhaustive investigation.

The first test applied was the alphanaphthol test, which is a group test for carbohydrates in general. It is applied by adding to a suspected sample of urine a few drops of a 10 per cent. alcoholic solution of alphanaphthol and then superimposing this liquid upon concentrated sulphuric acid. In the presence of any carbohydrate a violet zone is produced. This test resulted positively.

The Fehling test was then applied with the result as previously stated. The reaction showed a greenish turbidity, which was succeeded by a yellowish precipitate wholly unlike the normal copper reduction.

The Boettger test with bismuth subnitrate and solution of potassium hydroxide showed a marked reduction to the dark colored metallic bismuth.

The indigo carmine test for dextrose gave negative results.

A fermentation tube showed no evolution of CO_2 after twenty-four hours.

A polariscopic examination of the sample showed that it was optically inactive.

The phenylhydrazine test was then applied as follows: A clean, dry, six inch test-tube was filled to the depth of one-half inch with phenylhydrazine hydrochloride, one-half inch of dried sodium acetate was added, and the tube filled to half its capacity with the urine and immersed in a bath of boiling water for two hours. Upon cooling the contents of the tube a voluminous deposit of yellow crystals took place, which, when examined microscopically, were found to be in

stellate tufts of acicular crystals, resembling somewhat the groups produced by dextrose or levulose, but different in the character of the individual crystals, which seemed to be more slender in proportion to their length.

Several additional tubes of the crystals were prepared in a similar manner and some of the crystals were collected and purified by recrystallization. During this purification it was noticed that the crystals were much more soluble in hot water than is the case with ordinary dextrosazone. The purified crystals were found to have a melting point of 157° C. This corresponds very closely to the melting point of pentosazone, which was found by Salkowski and Jastrowitz to have a melting point of 166° C. to 168° C. when pure, but from 156° C. to 160° C. when obtained from urine. The melting point of dextrosazone (and levulosazone) is 204–205° C.

Several subsequent experiments upon fresh samples of material confirmed the melting point of the crystals, and the various specific tests for pentose were applied. Tollen's test, which is carried out by heating a solution of phloroglucin in hydrochloric acid and adding to the hot solution a small quantity of the urine, continuing the heat upon a water-bath for some time, gave positive results in the shape of a cherry-red liquid which became cloudy upon cooling.

As glycuronic acid also responds to this test, further confirmation was obtained by applying the orcin-hydrochloric acid test, which is carried out similarly to the one previously described, using orcin instead of phloroglucin. In the presence of pentose a bluish-green color is developed, which is dissolved out by shaking with amyl alcohol. Positive results being obtained by this test, thus negativing the presence of glycuronic acid, there seems to be no further doubt that there is exhibited in this sample of urine a well-developed case of pentosuria, as precisely the same results as above described were obtained in a specimen of urine from the same individual examined eleven months after the first sample was reported.

A more comprehensive examination of the sample showed the following:

Specific gravity	1.028	
Chlorides as sodium chloride	.94	per cent.
Total sulphates as SO_4	.31	per cent.
Mineral sulphate as SO_4	.30	per cent.
Ethereal sulphate by difference	.01	per cent.
Phosphates as P_2O_5	.30	per cent.
Urea	3.00	per cent.

A comprehensive clinical report of the case will appear in the *American Medical Journal* in the near future by Dr. S. Solis Cohen, to whom the writer is indebted for the material upon which the above experiments were made.

The pentose which occurs in urine is usually one of the several varieties of arabinose concerning which there is some confusion, however, in the literature on the subject.

THE COMPOUND POWDER OF PEPSIN AND THE COMPOUND ELIXIR OF PEPSIN.*

By George M. Beringer.

The introduction of these two preparations in the National Formulary has caused considerable comment and much adverse criticism that has been largely directed against the Elixir Digestivum Compositum. The Council on Pharmacy and Chemistry of the American Medical Association have investigated combinations of the ferments, pepsin, pancreatin, diastase, etc., placed on the market by a number of manufacturing firms, and have reported adversely and have gone to the limit in their condemnation and have requested the American Pharmaceutical Association to omit Elixir Digestivum Compositum from the next edition of the N.F.

These critics have overlooked the fact that the National Formulary was created to "obtain uniformity in dispensing and to supply authoritative standards for remedies frequently prescribed by physicians or demanded by the public." The responsibility for any "therapeutic absurdities" must rest with the prescriber and not with the dispenser and, as long as the physician prescribes such, the pharmacist is only discharging his duty in supplying.

Despite the criticism by these high authorities upon the liquid preparations combining these ferments, the dispensing pharmacist knows that there has been little if any diminution in the use of these by medical practitioners.

The writer notices that the use of this N.F. elixir and of the proprietary elixirs of similar composition as a vehicle for the administration of salicylates of sodium and strontium, bismuth salts,

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* Read before the Philadelphia Branch of the American Pharmaceutical Association, May 4, 1909.

bromides, etc., is really increasing. Very recently, he has heard reputable physicians commend such elixirs of pepsin and pancreatin and knows that the pharmaceutical manufacturers are supplying these to the dispensing physicians in five- and ten-gallon containers.

In a recent communication, Prof. C. Lewis Diehl, the Chairman of the N.F. Committee, says: "Nevertheless, we are confronted with the fact that Compound Digestive Elixir is the most frequently prescribed preparation of the National Formulary, and that this demand comes, not from that class of physicians which some one has facetiously designated as 'physicians who append M.D. to their names,' but largely from physicians who stand high in their profession and who enjoy the confidence and respect of the community in which they practice. In short, even though the three component enzymes reciprocally nullify their individual functions; even though, from the theoretical, chemical, and biochemical standpoint this preparation is a 'monstrosity'; it is a pertinent question whether we are justified in eliminating Compound Digestive Elixir from the Formulary, if it can be shown that reputable physicians insist on prescribing it, convinced that it is a desirable and efficient adjunct to other and more potent medicaments. For, to use a commonplace, 'we can lead a horse to water, but we cannot make it drink'; and so, if we expunge Compound Digestive Elixir from the Formulary, we can rest assured that those who wish to prescribe it will have no difficulty to have their prescription filled—if not with a preparation made by an authoritative formula, most likely with one or the other of the many proprietary preparations of the market."

It is established beyond any controversy that these compound elixirs of the digestive ferments have an extensive use in medical practice. It is not within the province of the National Formulary to recommend, nor to advise, nor to question, the therapeutic action of remedies dispensed on physicians' prescriptions, and as long as it makes no claim for the product it is only filling its mission and keeping well within its intended scope of simply supplying approved formulas.

It was a condition and not a theory that confronted the committee who introduced the formulas in the National Formulary and it remains a condition that confronts the committee that are now laboring on its revision. If the physicians consider these undesirable, they should cease prescribing them and the disuse would eliminate them from future revisions.

The question of the therapeutic incompatibility is one that the pharmacist cannot consider and, if introduced, would certainly queer many prescriptions. Again the views of physicians on many of these supposed therapeutic incompatibles are continually changing. Not many years ago, we were taught that opium and belladonna were incompatible, and pepsin and sodium bicarbonate should not be dispensed together. To-day, physicians know the proper modification of medical action and how to combine remedies to secure the potency or modified action desired, and we consider this phase of responsibility as belonging entirely to the physician.

The writer must not be understood as in the least defending either the therapeutic action or the chemistry of these compound preparations of the digestive ferments. While in no wise blamable for their inception he shares with his brother pharmacists only the responsibility of daily dispensing them and believes that he voices the demand of the dispensing apothecaries for accepted standard formulas for preparations so frequently dispensed on prescriptions.

On the contrary, it is admitted that my own independent experiments have convinced me that pancreatin in acid solution with pepsin is in a condition the least advantageous for the preservation of its characteristic properties and actions or for its subsequent isolation and proper testing. On the other hand, tests made in a sample of Compound Elixir of Pepsin made by the formula given below and more than a month old, showed that the pepsin had not suffered any marked diminution of its digestive value.

The compound powder of pepsin seems to be less prone to change and to keep fairly well for some time. We are not ready to accept the *a priori* conclusion of the chemist that pancreatin administered by mouth is destroyed by the acids of the stomach. Experiments by physiological chemists have demonstrated that after the extirpation of the pancreas in dogs absorption of fat is entirely abolished, although the fat be split up by bacterial fermentation. If, however, some pancreas be given to these dogs along with the fat, a portion of this fat is absorbed.

Since, then, there is a necessity for these formulas to meet the legitimate demands on pharmacy, it becomes pertinent to inquire if any improvement can be made in them, and the intent of this contribution is to present several proposed improvements for consideration.

Compound Powder of Pepsin.—It is proposed that the present

subtitle Pulvis Digestivus be deleted as suggesting therapeutic action, leaving the title only the Latin, Pulvis Pepsini Compositus, and the English translation Compound Powder of Pepsin.

The quantity of pepsin in the present formula is but 15 per cent. of saccharated pepsin equivalent to but 1.5 per cent. of pepsin U.S.P., a quantity *too small* to obtain satisfactory digestive activity or possibly to comply with the regulations of the Food and Drugs Act. It is proposed to increase this to 15 per cent. of pepsin so as to maintain its proportion equivalent to the pancreatin directed.

As the compound powder of pepsin is largely dispensed in powders and so becomes subjected to atmospheric exposure it is recommended that in this preparation the least hygroscopic form of pepsin be used, and it is proposed that the so-called "insoluble" powdered pepsin, of the official digestive value, be directed in its preparation, thus increasing its permanency and stability.

The text of this modified formula would read:

Pulvis Pepsini Compositus.
Compound Powder of Pepsin.

Powdered Pepsin (so-called "Insoluble" variety)	15 Gm.
Pancreatin	15 Gm.
Diastase	1 Gm.
Lactic Acid	1 c.c.
Hydrochloric acid	2 c.c.

Sugar of milk, a sufficient quantity to obtain 100 grammes of finished product.

Add the acids gradually to 60 grammes of sugar of milk and triturate until they are thoroughly mixed. Mix the pepsin, pancreatin, and diastase, and incorporate this with the acidified sugar of milk. Weigh, and add sufficient sugar of milk to make the weight 100 grammes. Triturate the mixture thoroughly and finally rub through a hair sieve and preserve the powder in well stoppered bottles.

Compound Elixir of Pepsin.—In this preparation it is proposed that the titles be changed by eliminating both the present Latin and English titles, Elixir Digestivum Compositum and Compound Digestive Elixir, as they may be possibly construed as therapeutic titles, and adopting as titles Elixir Pepsini Compositum, Compound Elixir of Pepsin. This is in harmony with the following resolution already adopted unanimously by the Committee on N.F.:

"The introduction of therapeutic or anatomical names in the future should be prohibited, and we recommend that present therapeutic titles be eliminated as far as is practicable."

An examination of the present N.F. formulas shows that in the Compound Powder of Pepsin pancreatin is in excess and the pepsin is insufficient. In framing the formula for Compound Elixir of Pepsin the pancreatin was reduced to 1 gramme per litre and the pepsin increased to 10 Gm. The elixir bears no relation to the powder either in the relative proportion of the ingredients or in representing a definite weight of the powder in a stated volume of product. One of the strongest claims made by the pharmaceutical manufacturers is that their lactated-pepsin elixirs represent 40 or 80 grains of compound powder of pepsin to the fluidounce and this carries weight with the practitioner and meets his desire. Other minor defects are the reduction in the amount of acids directed and insufficient flavoring due to the use of aromatic elixir instead of adding the oils direct as flavoring in the course of preparation. Orange is the accepted flavor which appears to be used by all the manufacturers and should be retained in the Formulary. The use of tincture of cudbear as a coloring introduces some variability in the color of products as made by different druggists due to the impossibility of entirely exhausting cudbear in making the tincture and the varying degree of successful exhaustion in the preparation by different manipulators.

In the formula submitted herewith it is proposed to have the elixir approximately represent one-tenth of the powder, or 100 Gm. of Compound Powder of Pepsin in 1 litre of elixir. The flavoring is orange and by the use of powdered cudbear a greater uniformity in product of different stores will be secured.

The following proposed formula is submitted for

Elixir Pepsini Compositum.
Compound Elixir of Pepsin.

Pepsin (soluble "scale or granular" variety)	15 Gm.
Pancreatin	15 Gm.
Diastase	1 Gm.
Lactic acid	1 c.c.
Hydrochloric acid	2 c.c.
Glycerin	250 c.c.
Alcohol	200 c.c.
Oil orange	2 c.c.
Cudbear	1 Gm.
Water, a sufficient quantity to make	1000 c.c.

Mix the acids with the glycerin and 500 c.c. of water, add the pepsin, pancreatin, and diastase, and macerate with occasional agitation until solution is effected. Then add gradually the alcohol, in which the oil of orange has been dissolved, agitating after each addition. Now add the cudbear and sufficient water to make the preparation measure 1000 c.c. Macerate for six hours with occasional shaking and then filter.

SUPERVISING THE IMPORTATION OF DRUGS.*

By Geo. W. Hoover.
U. S. Department of Agriculture.

The object of this paper is to convey briefly a general idea of the inspection of imported drugs under the Food and Drugs Act. Endeavor will be made to indicate some of the conditions at the outset of the enforcement of the law, and the changes and tendencies of conditions up to the present time.

It is deemed advisable, first, to give some idea of the facilities for drug inspection work throughout the United States. There are at present twenty-one working branches of the Bureau of Chemistry distributed throughout the United States. The function of such laboratories is to inspect imported and domestic food and drug products and do such work along the lines of investigation as may assist in the enforcement of the Federal Act. Six of the above laboratories were established and in operation at the time the law was passed, June 30, 1906. These laboratories were actively engaged in the inspection of imported food products under the appropriation act for the fiscal year beginning July 1, 1902, but drugs did not receive any consideration until the summer of 1907. It is interesting to note the changes which have taken place both as to quality and labelling of various products which are imported into the United States.

Attention is now called to some of the crude drugs. As the work progressed, improvements were noticeable, and many of the old time violations no longer obtain. For example, examinations showed that importations of belladonna root were heavily adul-

* Read at the meeting of the Philadelphia Branch of the American Pharmaceutical Association, April 6, 1909.

terated with phytolacca root. In one instance the belladonna root did not exceed 12 per cent. and the content of mydriatic alkaloids was correspondingly low. Belladonna leaf is another drug similarly adulterated and depreciated in value by being mixed with stems, phytolacca, scopola, and other foreign leaves. Some importations of hyoscyamus contained large admixtures of scopola, stramonium, and plantago leaves, and other consignments of henbane consisted wholly of hyoscyamus muticus, the alkaloidal value of which is seven to ten times greater than henbane proper, and possesses different physiological properties. It can readily be seen that unreliable and dangerous preparations might result when manufactured from drugs of the above character. A number of importations were offered for cannabis indica under the title "cannabis Madagascar." The purpose of this spurious product was to substitute cannabis indica proper. The sample seemed to resemble the genuine drug, but no definite information was available as to whether or not it possessed the same therapeutic properties. Other violations which may be enumerated are as follows: aconite, deficient in aconitine; digitalis, of very inferior quality; dandelion root, of poor quality and mixed with ground rock; kamala, large excess of added sand and dirt; scopola, deficient in alkaloid; coto bark, substituted by para coto or false coto; simaruba, wholly spurious; matico leaves, substituted by spurious products; and in one instance, maracaibo supplied for cinchona bark.

In some instances when the importer or consignee was apprised of the true findings and violations of the law, a desire would be immediately expressed to have such goods exported at once, for the reason that in placing the order it was specified that goods were to be of such quality as to fully meet the requirements of the law. Other importers would maintain that the findings were incorrect because they had handled similar products for years without any complaint and that such goods had been purchased from firms of standing and reputation. There is no doubt that in many cases the sincerity of the dealers was genuine, but nevertheless they had been, according to their own testimony, selling these spurious products, in some instances for thirty years or more, believing all this time that such articles were in harmony with the representations made.

The saffron situation has presented some very interesting features and there is no doubt from the evidence and findings that this product has been very extensively adulterated in various ways.

Numerous importations of this product have been examined and in some instances there has been revealed upwards of 40 per cent. of mineral matter, usually potassium or sodium nitrate or calcium sulphate. Other shipments invoiced as saffron were found to consist chiefly and in some instances entirely of calendula florets colored with aniline dye. Upon the suppression of this practice it was not long until calendula florets colored with coal-tar dye, invoiced calendula, appeared for entrance into the United States; this product was also refused entry owing to its improper importation and the obvious purpose for which it was intended to be used.

The violations met under the misbranding feature of the law are not uncommon. In many instances the proscribed drugs such as morphine, cocaine, phenacetin, acetanilid, and especially alcohol, are not declared. This violation is prevalent always, and notably in case of the alcoholic preparations unwarranted claims are often made relative to the remedial virtue of the products. These preparations are found usually to contain from 15 to 45 per cent. alcohol, with small amounts of aromatics, and occasionally such constituents as cinchona, gentian, etc., in sufficient quantity to impart a slightly bitter taste, and often colored with caramel or a coal-tar dye. Evidence is usually introduced to the effect that the product is sold as a beverage, or else false and misleading statements are held to be proper by the importers; in other instances the consignee is a railroad, express, or telegraph company, and the ultimate consignee cannot be located. Others request permission for relabelling so that same will be in harmony with the law.

Again, some manufacturers cling to misrepresentative names with great tenacity. One example is a product sold extensively throughout the United States and, according to the company's own literature, throughout the world, which was being imported into the United States under the name of "Fruit Salt." The product was found to consist virtually of equal parts of tartaric acid and sodium bicarbonate. Such importation was justly deemed misbranded under the law, and it was only after many months that this question was finally adjusted which resulted in the manufacturers labelling their product "Fruit Salt Derivative Compound, containing 48 per cent. of fruit derivative together with about 52 per cent. of alkaline salt for producing effervescence." This serves only as a striking illustration of the time required and manner of concluding some of the questions that are constantly arising.

Another serious feature met with in imported goods is the false claims and misrepresentations made upon labels, cartons, and accompanying literature of certain articles. A product, commonly known as pills of ferrous carbonate, which is beyond doubt an efficient remedy for various conditions and which has a worthy place as a remedial agent, is claimed by the manufacturers to be a positive cure for a number of diseases, among which are enumerated scrofula, consumption, locomotor ataxia, and epilepsy. In other cases the claims are confined to a given system as circulatory, digestive, respiratory, etc. Still others restrict themselves to special organs; for example, a certain product has been met with which is recommended for all diseased conditions of the kidneys and all troubles arising from such abnormalities. Upon examination this particular article was found to be composed of methylene blue and oil of juniper. Other preparations are exploited as never-failing cures, or specifics for certain diseases, the pathogenic conditions of which are such as to preclude the successful treatment by medicinal remedies alone. The most that can possibly be accomplished by such remedies is palliative in character. The products include the so-called positive cures for such diseases as diabetes, syphilis, cancer, asthma, epilepsy, locomotor ataxia, and the various forms and stages of tuberculosis.

A product, for example, claiming to be a sure and positive cure for all forms of epilepsy was found upon examination to contain alcohol, morphine, neither of which was declared, ammonium iodide, and perhaps a small quantity of bromide. Another preparation represented to be a cure for all forms of tuberculosis consisted approximately of 95 per cent. sucrose. A product for the cure of syphilis claimed that the use of this preparation would cure the disease in a " very brief time." Among other constituents stated to be present in remedial quantities were strychnine, cocaine, and mercury. An examination showed cocaine and strychnine were absent and but a mere trace of mercury present, certainly not in sufficient quantity to produce results in the period of time referred to. It is represented as surpassing any and all other preparations for this disease. The most alluring descriptions of results achieved in this treatment are set forth in the accompanying literature.

It may be said in passing that every possible care is being exercised to prevent goods bearing labels which are false and misleading from coming into the United States.

Another problem which sometimes arises in connection with imported drugs is the true declaration relative to the manufacturer or the place of production. There have been cases of this character; for example, a product may be entered through the port of New York, and it is subsequently found that such article is an imitation of the genuine or for some reason there is a misrepresentation relative to the place of manufacture. It has been the practice to institute an investigation and ascertain if possible the true situation, and in most cases this has been successfully accomplished through the assistance of the foreign consul and agents in arriving at just and satisfactory conclusions. It may be said, however, that this problem is sometimes attended with difficulties. There have been many complaints and contentions in regard to various brands of one well-known remedy imported from Holland. Although there is on file a large mass of information from various sources, the evidence is not yet sufficient to indicate who is rightfully entitled to the name. It is, however, encouraging to note that in so far as is known the numerous false claims formerly made for the medicinal virtue of the preparation, whether genuine or not, have been changed by the various manufacturers and dealers.

Some interesting features have developed in connection with the use of the term " for technical use " or some similar phrase, in a number of cases of certain products as cassia oil, balsam Peru, gum benzoin, etc. It appears that these are employed more or less in the manufacture of certain products, as perfumes and soaps. These goods have been imported in a large number of cases under names recognized in the U. S. P. and when such products are found not to comply with the requirements of this authority the importers in most cases request permission to relabel " for technical use only," and are perfectly willing to make affidavit to the effect that they themselves will not use the product for other than technical purposes, but they apparently are not willing to make themselves responsible for the disposition of the goods after leaving their hands. Consignments labelled " for technical purposes only " have been released in the past and such goods were found subsequently in the regular pharmaceutical trade. The embarrassing position in which such practice is liable to place certain dealers can readily be seen. For example, if oil of cassia, containing rosin and heavy metals, is permitted entry into the United States, labelled " Oil of Cassia, U.S.P. " or " Oil of Cassia " with no qualification, an innocent

dealer might be placed in a very unpleasant position. Thus, the proper labelling and declaration are matters of the greatest importance.

There are several points in connection with senna siftings and smilax rhizomes worthy of attention. In connection with senna siftings numerous importations have been found to contain an excessive quantity of mineral matter, in one instance as much as 35 per cent. Smilax rhizome is that part of the sarsaparilla especially directed by the U.S.P. to be rejected in the manufacture of sarsaparilla preparations. It has been maintained by some that it would be perfectly proper to manufacture U.S.P. products from these goods, and to show to what extent some of these matters are carried it may be said that there has been submitted only recently a product labelled " Fluidextract of Senna, U.S.P." made from senna siftings, and " Fluidextract of Sarsaparilla," made from rhizomes. There is no question whatever that products manufactured and labelled as indicated above are in violation of the law.

There has been some question relative to the use of such words as " synthetic " and " artificial " in connection with such products as balsam Peru and oil of bitter almond; that is, a number of importations have been invoiced as oil of bitter almond, oil of almond, or bitter almond oil, artificial. These shipments upon examination proved to be benzaldehyde and inasmuch as both benzaldehyde and oil of bitter almond are recognized and defined in the U.S.P., it would not be proper for benzaldehyde to be imported and sold under the name " oil of bitter almond " or " oil of almond, artificial," but it should be labelled " benzaldehyde."

The situation in connection with balsam Peru is somewhat different; there have been various importations invoiced as artificial balsam Peru and synthetic balsam Peru. An examination of the products revealed the fact that the articles did not comply with the tests prescribed in the U.S.P. for balsam Peru. This article has been represented as taking precedence for medicinal use to the genuine product in the country of production, but it is well known that this imitation balsam Peru is restricted in sale in the country of production. It is therefore in violation of Section 11 of the law and, further, inasmuch as it is clearly an imitation article, it is in violation of Section 8 of the law, which states that an article shall be deemed misbranded in case of drugs first, if it be an imitation or offered for sale under the name of another article.

In a number of cases it has been represented that it was difficult to control the gathering or collection of certain commodities because of the character of the labor and nature of the materials, but this contention is apparently not well founded because numerous importations of such goods are being offered which are found satisfactory.

There is no doubt but that a certain small per cent. oppose the proper enforcement of the law in reference to imported goods and apparently do much to defeat its purpose, but it is gratifying to know that the vast majority of importers, manufacturers, and various dealers have co-operated faithfully in its enforcement. Upon various occasions generous support and aid have been given by supplying specific information upon particular points involved, and it is largely due to this spirit of co-operation and assistance that it may be said the law is becoming more effective daily. The evidence furthermore shows that foreign dealers recognize the fact that the United States is no longer the dumping ground of their refuse products, which have little or no sale in their own country.

CHARLES DARWIN, AS A BOTANIST.*

By John W. Harshberger, Ph.D.

Charles Darwin lies buried in Westminster Abbey in the north aisle of the nave close to the angle of the choir-screen beside the body of Sir John Herschel, the celebrated astronomer, and not far off in the central part of the nave lie David Livingstone, the African explorer, and Sir Isaac Newton, the philosopher and mathematician. Truly in this cathedral-mausoleum and in the most prominent places lie the mortal remains of a galaxy of great men of whom the English-speaking race may be justly proud. No honor too great can be bestowed upon men of such sterling intellectual worth. Darwin formulated the principles of organic evolution; Sir Isaac Newton was the formulator of the law of gravitation; Sir John Herschel explored the starry realm and made many discoveries of importance, while David Livingstone with unequalled determination opened up the dark continent to the knowledge of civilized men.

* A paper read before the Association of Doctors of Philosophy, University of Pennsylvania, on the occasion of the Darwin Centenary Memorial meeting held Friday, February 12, 1909, at the University.

Each of them made explorations into the unknown and each contributed something to dispel the ignorance and superstition which enshrouded the true conception of the universe. Darwin began his scientific career with the voyage of the H. M. S. *Beagle.* He is usually considered to be a biologist in the narrow sense in which that term is generally used in its application to zoölogists, and yet some of his most important discoveries were made by him as a botanic investigator. We find all through the journal of his voyage around the world reference to his observations of the plant life of the countries which he visited. I cannot do better by way of an introduction to what follows than to make a few quotations from the pages of his diary where he mentions particularly his study of the plants in the field, while collecting them for the subsequent study of specialists, such as Sir Joseph Hooker, Professor Henslow, and Reverend M. J. Berkley. His delight and enthusiasm as a naturalist on seeing the Brazilian vegetation near Rio Janeiro for the first time are expressed thus: "Following a pathway I entered a noble forest, and from a height of five or six hundred feet, one of those splendid views was presented, which are so common on every side of Rio. At this elevation the landscape attains its most brilliant tint, and every form, every shade, so completely surpasses in magnificence all that the European has ever beheld in his own country, that he knows not how to express his feelings. The general effect frequently recalled to mind the gayest scenery of the Opera-house, or the great theatres. I never returned from these excursions empty handed." That comprehensiveness of view which characterize the writings of Darwin as a finished naturalist is exemplified in the journal, while he was an apprentice on board the *Beagle.* In one paragraph he gives us in a nutshell a complete description of the vegetation of South America which I, as a plant geographer, cannot refrain from quoting in full. Darwin writes: "Confining our view to South America, we should certainly be tempted to believe that trees flourish only under a very humid climate; for the limit of the forest-land follows, in a most remarkable manner, that of the damp winds. In the southern part of the continent, where the western gales, charged with moisture from the Pacific, prevail, every island on the broken west coast, from lat. 38° to the extreme part of Tierra del Fuego, is densely covered by impenetrable forests. On the eastern side of the Cordillera over the same extent of latitude, where a blue sky and a fine climate prove

that the atmosphere has been deprived of its moisture by passing over the mountains, the arid plains of Patagonia support a most scanty vegetation. In the more northern parts of the continent, within the limits of the constant southeastern trade-wind, the eastern side is ornamented by magnificent forests; whilst the western coast, from lat. 4° S. to lat. 32° S. may be described as a desert; on this western coast northward of lat. 40° S., where the trade-wind loses its regularity, and heavy torrents of rain fall periodically, the shores of the Pacific, so utterly desert in Peru, assume near Cape Blanco the character of luxuriance so celebrated at Guayaquil and Panama. Hence in the southern and northern parts of the continent the forest and desert lands occupy reversed positions with respect to the Cordillera, and these positions are apparently determined by the direction of the prevalent winds. In the middle of the continent there is a broad intermediate band, including Central Chile and the provinces of La Plata, where the rain-bringing winds have not to pass over lofty mountains and where the land is neither a desert nor covered by forests. But even the rule, if confined to South America, of trees flourishing only in a climate rendered humid by rain-bearing winds, has a strongly marked exception in the case of the Falkland Islands. These islands, situated in the same latitude with Tierra del Fuego and only between two and three hundred miles distant from it, having a nearly similar climate, with a geological formation almost identical, with favorable situations, and the same kind of peaty soil, yet can boast of few plants deserving even the title of bushes; whilst in Tierra del Fuego it is impossible to find an acre of land not covered by the densest forest." With the same scrupulous care of details and in his characteristic straightforward style, Darwin goes on in his journal to describe the history of the voyage with Captain FitzRoy, together with a sketch of those observations in natural history and geology which the young naturalist hoped might possess some interest for the general reader. Darwin's hope that his observations might prove of some interest as well as remain of general value has had a recent exemplification. At the meeting of the American Association for the Advancement of Science held in Baltimore during the last Christmas holidays, Prof. Roland Thaxter, of Harvard University, described in a very entertaining manner the result of a trip to the southern end of South America in the Straits of Magellan and by way of introduction spoke of the botanic observations of Charles Darwin on the beech forests of

that little known country, which showed the keenness with which every natural object was scrutinized by him. A peculiar family of sac fungi (Ascomycetes) contains only one genus Cyttaria having the appearance of the morel (Morchella), but without a stem. All known species are parasitic on the evergreen beech, Nothofagus. The fruit bodies of this fungous parasite often grow in dense clusters, springing from swollen portions of the host which it partially deforms. The different species which are found in Chile, Patagonia, Tasmania, and New Zealand are edible and at one time formed a staple food of the natives. Specimens were collected by Prof. Thaxter on his recent visit and in connection with this recent reminder of Darwin's observations on this fungus the following may be mentioned appropriately. The forest commences at the line of high-water mark, and was so thick that it was necessary to have recourse to the compass to find one's way. "In the deep ravines, the death-like scene of desolation exceeded all description; outside it was blowing a gale, but in these hollows not even a breath of wind stirred the leaves of the tallest trees and it was gloomy, cold, and wet. In the valleys it was scarcely possible to crawl along, they were so completely barricaded by great mouldering trunks, in the case of the Winter's Bark (Drimys Winteri) four to six feet in girth and the beech seven feet in diameter, which had fallen down in every direction. In this forest grows one vegetable production deserving of notice as an article of food to the Fuegians. It is a globular, bright yellow fungus, which grows in vast numbers on the beech trees. When young it is elastic and turgid, with a smooth surface; but when mature it shrinks, becomes tougher, and has its entire surface deeply pitted or honey-combed. In Tierra del Fuego the fungus in its tough and mature state is collected in large quantities by the women and children, and it is eaten uncooked. It has a mucilaginous, slightly sweet taste, with a faint smell like that of a mushroom." So much for the botanic observations of Darwin as recorded in the "Journal of Researches into the Natural History and Geology of the Countries Visited during the Voyage of the H. M. S. *Beagle* round the World."

Darwin's work as a botanist was many-sided. In the published list of 116 separate titles of books and papers contributed directly to science, 37 books and papers are strictly botanic, the rest are zoölogic, geologic, and devoted to the subject of general evolution. One-third then of all the scientific contributions of Darwin

are botanic and before commenting on the character of his botanic studies let me briefly enumerate his most important botanic writings.

The following important books should be mentioned: "On the Contrivances by which Orchids are Fertilized by Insects," 1862; "The Variation of Animals and Plants Under Domestication," 1868 (two volumes); "Insectivorous Plants," 1875; "The Movements and Habits of Climbing Plants," 1875; "The Effects of Cross and Self-Fertilization in the Vegetable Kingdom," 1876; "The Different Forms of Flowers on Plants of the Same Species," 1877; "The Power of Movement in Plants," assisted by Francis Darwin, 1880.

His minor botanic contributions I will divide for sake of treatment into the following categories: (1) papers dealing with the pollination of flowers; (2) papers dealing with plant distribution; (3) papers dealing with the movements of plants; (4) papers dealing with questions of physiologic botany. Darwin in the papers of the first group dealt with the agency of bees in the fertilization of papilionaceous flowers, on the fertilization of winter flowering plants, on the fertilization of the Fumariaceæ, but the most important contributions included in this group were those on the two forms or dimorphic condition of the species of Primula and their remarkable sexual relations, on the three remarkable sexual forms of Catasetum tridentatum and on the sexual relations of the three forms of Lythrum salicaria. Darwin retained his interest in questions of geographic distribution even after he had settled to the quiet life at Down. Two short papers are of interest in this connection. While on the *Beagle,* he had studied the problems connected with the origin of the vegetation of oceanic islands. To account for the distribution of many plants of the Pacific Islands the botanist must have recourse to sea currents to explain the phenomena. Darwin's paper on this subject in the *Gardener's Chronicle* deals with the vitality of seeds, his second paper treats of the action of sea-water on the germination of seeds and appeared in the *Journal of the Linnaean Society.*

The papers dealing with the movements of plants may be dismissed here without further comment, because most of the observations recorded in them were published in his more pretentious works on the same subject. I can find only two papers of a purely physiologic character, namely, one on the action of carbonate of ammonia on the roots of certain plants, and another on the action

of this same chemical on the chlorophyll bodies. Having briefly summarized the books and papers which bear strictly upon botany, it is important briefly to describe the botanic work which appeals to the speaker as being of the greatest import to the science. Darwin's activity as a botanist extended over a period of about fifty years, from 1831, when he left England on the voyage of the *Beagle,* until late in 1881, when on a call upon Mr. Romanes in London, in December, he was seized when on the door-step with an attack apparently of the same kind as those which afterwards became so frequent. During the fifty years of active life, he accomplished a tremendous amount of scientific work, notwithstanding the fact that he was a great sufferer and frequently was incapacitated altogether.

It would be incorrect to state that all of Darwin's botanic work will be lasting. The experience of breeders was inadequate to the purposes of Darwin's theories. It was neither critic nor scientific. Laws of variation were barely conjectured; the different types of variability were distinguished imperfectly. Quetelet's law of variation had not yet been published. Mendel's law of hybrids was unknown. Innumerable minor points which go to elucidate the breeder's experience were unknown in Darwin's time. No wonder that he made mistakes, and laid stress on modes of descent which have been proved to be of minor importance or even of doubtful validity. Yet with all these apparently insurmountable difficulties Darwin discovered the great principle which rules the evolution of organism, viz., natural selection. His scientific observations and experimental work were of the most painstaking and detailed character. He had developed a power of sticking to a subject until he had mastered it to his satisfaction. He used almost to apologize for his patience, saying that he couldn't bear to be beaten, as if this were rather a sign of weakness on his part. He often quoted the saying, "It's dogged as does it." He laid the foundations of modern scientific methods of thought and as the formulator of the principles of organic evolution his name will go down to posterity. In the twenty-seven years since his death, the problems in botany and zoölogy have been attacked from many standpoints until with the advances that have been made in paleontology, histology, cytology, physiology, taxonomy, and the breeder's art, the theories of organic evolution have been revolutionized almost entirely, and we have sects of Neo-Darwinists and Ultra-Darwinists and what not.

The advances that have been made by the assistance of many workers have necessitated a restatement of all of the most important doctrines which Darwin enunciated. Take, for example, the emphasis which he laid upon the principle that Nature abhors continuous self-fertilization. He has given us by his experiments narrated in "Cross and Self-Fertilization in the Vegetable Kingdom" some accurate data tending to show the actual effect of inbreeding for a great variety of species. His experiments were with some 57 species, belonging to 52 genera. One of his most extensive series of experiments was carried on with the common morning glory (Ipomœa purpurea). This species was bred, both crossed and self-fertilized, for ten generations. In every generation, the crossed forms were larger than the self-fertilized, the average being as 100 is to 77. Not only that, but they were more productive. In the sixth generation, however, there appeared a specially vigorous plant that overtopped its own competitor by half an inch, and exceeded in height all but three of the series. Darwin named this plant "Hero" and remarks, "I was so much surprised at this fact that I resolved to ascertain whether this plant would transmit its powers of growth to its seedlings." Accordingly, he fertilized a number of flowers of Hero with their own pollen and planted seedlings in competition with inbred plants and with the cross-bred as well. The results obtained showed that Hero and its descendants varied from the common type not only in acquiring great power of growth and increased fertility, when subjected to self-fertilization, but in not profiting from a cross with distinct stock. Although Darwin was surprised at Hero and its descendants, yet he mentioned the case as obviously contrary to the usual procedure among plants. We now know, however, that there are many hundreds of plants which possess cleistogamous flowers, which are habitually self-pollinated without any apparent diminution in vigor or hardiness, as, for example, our common blue violet which produces seed more abundantly underground from cleistogamous flowers than from the bright blue flowers which are one of the glories of our hillsides in the early springtime. The same general exception has been proved in animal breeding, where line breeding has been found one of the most powerful methods of improving the race of our common domestic animals, and that inbreeding of the most pronounced kind is not always detrimental provided the breeder selects the animals to be bred with reference to their vigor and fertility.

Darwin established the department of biology known to-day as ecology. With Darwin as a botanist we are especially concerned, so that we may refer in particular to work which he did in plant ecology. The first botanic book to appear was a little treatise on the pollination of orchids by insects, published separately, as it was too large to be incorporated with any other subject, and its object was to show that the contrivances by which orchids are fertilized are as varied and almost as perfect as any of the most beautiful adaptations in the animal kingdom, and secondly to show that these contrivances have for their main object the fertilization of the flowers with pollen brought by insects from a distant plant. One of the most curious of the orchids studied by Darwin was Coryanthes speciosa, the flowers of which are very large and hang down. The distal part of the lip petal forms a large bucket over which arise two appendages which drop fluid into it. When the labellum bucket is full the fluid overflows by a spout, which is over-arched by the column which bears the stigma and pollen-masses in such a position that an insect, which has had an involuntary bath in the liquid by falling into it, is compelled to force its way out through a narrow passage so placed that the insect first brushes its back against the stigma and afterwards against the viscid disks of the pollen-masses and thus removes them, to be carried in flight to another flower.

Darwin's ecologic observations on insectivorous plants began after his curiosity was aroused by the common sundew. He writes: "During the summer of 1860 I was surprised by finding how large a number of insects were caught by the leaves of the common sundew Drosera rotundifolia on a heath in Sussex. I had heard that insects were thus caught, but knew nothing further on the subject. I gathered by chance a dozen plants bearing fifty-six fully expanded leaves, and on thirty-one of these dead insects or remnants of them adhered." After the most painstaking experimental study of the plant Darwin concludes, "The results have proved highly remarkable, the more important ones being, first, the extraordinary sensitiveness of the glands to slight pressure and to minute doses of certain nitrogenous fluids as shown by the movements of the so-called hairs or tentacles; second, the power possessed by the leaves of rendering soluble or digesting nitrogenous substances, and of afterwards absorbing them; third, the changes which take place within the cells of the tentacles when the glands are excited in various ways."

During many years Professor Asa Gray of Harvard University maintained an active correspondence with Darwin, who was enabled to secure and observe a number of American plants of striking ecologic type. Stimulated to inquiry by a paper of Prof. Gray's on the movements of the tendrils of some cucurbitaceous plants, Darwin undertook the study of over 100 widely distinct species of climbing plants which presented sufficient novelty to justify him in publishing his book of 208 pages entitled "The Movements and Habits of Climbing Plants," which appeared in 1876. His study led him to divide them into four classes: first, those which twine spirally round a support, and are not aided by any other movement; second, those endowed with irritable organs, which when they touch any object clasp it; such organs consisting of modified leaves, branches, or flower peduncles. Plants of the third class ascend by the aid of hooks, and those of the fourth by rootlets. As to the evolution of the climbing habit Darwin concludes that leaf climbers were primordially twiners and tendril bearers (when formed of modified leaves) were primordially leaf climbers.

A typic flower has a pistil surrounded by a row of stamens so that it would seem at first sight easy for the pollen to fall on the stigma. Such self-pollination does happen, but in the majority of flowers there are three principal modes by which self-fertilization is presented. First, in many species the stamens and pistils are situated in different flowers; such species are called diclinous, which is either monœcious with the distinct flowers on the same plant or dicœcious on different plants. Second, Sprengel discovered dichogamy where the pistil and stamens mature at different times so that, as in Arum, when the pistil matures before the anthers these plants are proterogynous, when the anther matures before the pistil proterandrous. Darwin discovered the third method in the presence of two or more kinds of flowers (heteromorphism) on the same species differing in the relative position of the stamens and the pistil which are so placed as to favor the transference by insects of the pollen from the anther of the one form to the pistil of the other. Plants with two kinds of flowers are called dimorphic, those with three kinds trimorphic. The results of these studies were incorporated in a volume entitled "Different Forms of Flowers on Plants of the Same Species," 1877, dedicated to Professor Asa Gray as a small tribute of respect and affection.

The last volume by Darwin of a botanic character was one

entitled "Power of Movement in Plants," where, with this title as a text, Darwin shows that apparently every growing part of every plant is continually circumnutating though often on a small scale, and in this universally present movement we have the basis for the acquirement of the most diversified movements. Thus, the great sweeps made by the stems of twining plants and by the tendrils of other climbers result from a mere increase in the amplitude of the ordinary movement of circumnutation. The leaves of various plants, as the clover, sleep at night, in other cases various organs show movements to the light or from the light, as again are equally prevalent movements of stems, etc., towards the zenith, and of roots towards the centre of the earth. Darwin laid the foundation for the ecologic study of these various tropisms which the use of modern experimental methods of research have extended and made more exact by the automatic recording of the movements by suitably designed apparatus connected with the growing plant.

Other botanists may have exceeded Darwin in the extent and variety of their discoveries, but Darwin represents an era of philosophic thought, and as the centre of the intellectual maelstrom which his theories created, he naturally stands, as Saul did of old, head and shoulders above his scientific contemporaries. One of the greatest of these was Karl Naegeli. He was one of the first among German botanists to introduce a strict method of thought, but Naegeli's method was applied to facts which as facts were inaccurately observed. Darwin collected data from the literature in support of an idea, Naegeli applied his logic to observations which were in part untrustworthy, but this much must be said that Darwin's "Origin of Species," published in the year 1859, delivered us from the unlucky dogma of constancy. He removed the mediævally placed shackles from the theories of the organic world and introduced a new philosophy more in harmony with the facts—the end of which is not yet.

BOOK REVIEWS.

ARBEITEN AUS DEM PHARMAZEUTISCHEN INSTITUT DER UNIVERSITÄT, BERLIN. Herausgegeben von Dr. H. Thoms. Vols. 4 and 5, Berlin, 1907 and 1908.

These two, large 8vo volumes of 340 pages respectively contain an account of the work done in the Pharmaceutical Institute of the University of Berlin. Unfortunately for American pharmacy, and not to the credit of American pharmacists, it must be said that these annuals, and the work that is recorded in them, are as yet comparatively unknown in this country, and the precedent that is being established, in Germany, for pharmaceutical schools and pharmaceutical associations has, as yet, not been followed by a single institution in this country. It is doubtful indeed if any appreciable number of even the teachers in schools and colleges of pharmacy in this country know of the existence of the Pharmaceutical Institute of Berlin, to say nothing of their having any definite knowledge of the work that is being done by the teachers, scientists, and investigators that are taking such an active part in the various activities of that institute.

The Pharmaceutical Institute of the University of Berlin, essentially a pharmaceutical school, was opened on the 27th of October, 1902, under the direction of Dr. H. Thoms. The attendance of students during the semester 1902–1903 was 101, and during the corresponding semester of 1905–1906 the recorded attendance reached 212.

In addition to being a school for students, the institute has also undertaken original investigations in a number of branches relating to pharmacy.

Perhaps the work that is of more direct interest to pharmacists, certainly the work that has proven itself to be of most immediate importance, is the investigations undertaken in 1903, at the instigation and with the pecuniary assistance of the German Society of Apothecaries, bearing on the composition and testing of new medicinal compounds, pharmaceutical specialties, and secret remedies. The reports of the work done in this connection are published from time to time in the "Apotheker Zeitung Berlin," and many, if not all, are subsequently reprinted in the annual reports of the institute, of which, up to the present time, five volumes have been published.

This particular branch of the work of the institute early assumed

international importance, and in 1906 the director of the institute, Dr. H. Thoms, was elected a corresponding member of the Council on Pharmacy and Chemistry of the American Medical Association. In addition to this evidence of appreciation of the activities of the institute, by American physicians, individuals, associations, and even government officials in all parts of Europe have followed the work with interest and are beginning to look to the Pharmaceutical Institute as a source of reliable information regarding the composition and properties of new remedies of all kinds.

As might be expected, the institute and the men engaged in the work have been vigorously attacked and maligned by the manufacturers of the secret or fake remedies that have been exposed. These exposures that, as has been pointed out before, have been made at the instance of the German Apothecaries Society, have again demonstrated that the composition of many of the proprietary articles now on the market is quite different from that indicated by the claims made for them by the manufacturers, and have also served to show anew that manufacturers of nostrums not infrequently vary the composition of their preparations at will.

In addition to the chemical work that has been done in connection with new remedies and the investigation of various chemical problems, comprehensive experiments in drug cultivation have been instituted. For several years experiments have been conducted in the cultivation of the poppy plant, for the production of opium and opium alkaloids. In this connection Turkish and Persian, as well as a number of hybrid German, poppy plants were experimented with. The effect of various nitrogen-containing fertilizers on the alkaloidal content of the poppy plant has also been studied, and the completed studies, to appear in a future annual, will no doubt prove interesting and valuable as a contribution to our knowledge of alkaloid yielding drugs.

The experimental grounds include a total of 5000 square metres largely, if not entirely, devoted to the cultivation of medicinal plants and the study of the effect of various fertilizers on the composition of these plants.

With such a variety of activities it might well be expected that the annual reports of the work should be unusually interesting. The two volumes now before us contain 81 and 89 contributions respectively, and the material presented covers a variety of subjects varying from an elaboration of identity tests for legitimate new

remedies to the exposure of the composition of suspicious preparations and secret remedies, and from original investigations on perplexing problems in organic chemistry to more or less routine examinations of the products of German colonies.

Taking Volume 5 as reflecting the scientific activities of the institute, we find that it contains reports on twenty-five new remedies, records the investigations on forty-six proprietary and secret remedies, and includes eighteen additional contributions on studies in organic chemistry and the chemical investigation of foods and technical products originating in the German colonies.

Altogether it may be said that these annual reports are well worth bringing to the attention of American pharmacists, and the work that is being done in the Pharmaceutical Institute of the University of Berlin should serve as an incentive for schools of pharmacy and pharmaceutical associations, in this country, to engage in the same line of investigation and thus demonstrate, in a practical way, that they are really willing to live up to the ideals that have been set by the early followers of pharmacy in this country.

M. I. WILBERT.

RUDIMENTS OF LATIN. With special reference to the nomenclature of the U. S. Pharmacopœia, the National Formulary, and the text-books in materia medica and botany. By Julius William Sturmer, Ph.G., Professor of Pharmacy, Purdue University, Lafayette, Ind.

This book will impress the teacher of pharmaceutical or medical Latin as an eminently practical one. As the author states in his preface, a knowledge of certain fragments of Latin grammar is indispensable to the mastering of the nomenclature of pharmacy and medicine and their allied sciences. The student of these subjects does not need to concern himself with many grammatical forms, nor to any great extent with the principles of Latin syntax, but a knowledge of the terminology is absolutely essential for correct work. It is upon this fact that Professor Sturmer lays especial emphasis and it is this feature which differentiates the book from other works on the Latin of pharmacy and medicine. The formation of Latin titles and their use in prescription work occupy a large portion of the book, and the subject is presented in such a clear and systematic manner that the student must be dull indeed who does not understand the principles involved. The exercises for practical

work by the student are very helpful and the number of these might have been increased with profit.

Professor Sturmer's arrangement in presenting first the nominative and genitive cases as the forms most used in the nomenclature, while the full declension is deferred until these forms have been mastered, is also to be commended. In fact, the book shows that it is the work of an experienced teacher, who places stress at the proper points and who presents the essential facts with force and clearness. W. S. TRUESDELL.

THE STUDY OF NATURE. By Samuel C. Schmucker, A.M., Ph.D., Professor of Biological Sciences in the West Chester (Pa.) State Normal School. With illustrations by Katharine E. Schmucker. J. B. Lippincott Company, Philadelphia and London, 1908.

This book is one of Lippincott's Educational Series edited by Martin G. Brumbaugh, Superintendent of Schools, Philadelphia, and, having in addition been written by a teacher of biology in a State normal school, we would expect that the rules given for guiding the pupils would be models of their kind, and indeed this appears to be the case. The key-note of the book is given in the very first paragraph, where the author says, "Nature study is the study of nature."

The book comprises 315 pages, including index, and is divided into three sections, the first being devoted to theoretical considerations; the second, to the materials which are typical and available for study, including seven chapters on animals, two on plants, and one on "The Heavens"; and the third, to suggestions on a course of nature study covering the first, second, third, and fourth grades. In this latter section a list of nature study books is given, together with comments on each. F. Y.

EXPERIMENTAL PHARMACOLOGY. By Charles W. Greene, University of Missouri. Third edition, revised, with 37 new illustrations. Philadelphia: P. Blakiston's Son & Co. $1.00.

Professor Greene's work is intended as a laboratory guide for the study of the physiological action of drugs. The action of a number of drugs is considered; as on the frog, on the ventricular muscle, on the frog's heart, on the isolated mammalian heart, on the frog's gastrocnemius muscle, human muscle, circulatory and respiratory system of the mammal, and as influencing the reaction

time of the reflex frog. The following drugs are used: alcohol, ether, chloroform, chloral hydrate, the opium alkaloids, caffeine, strychnine, cocaine, quinine, atropine, scopolamine, nicotine, curare, pilocarpine, physostigmine, aconite, veratrine, digitalis, ergot, suprarenal gland, nitroglycerine and the nitrites, phenol, potassium, calcium, and barium salts.

The principles involved in carrying on the various experiments are discussed, and descriptions of apparatus together with special methods are given in the last twelve pages.

It is a timely book but has not been developed along the practical lines of testing of drugs, such as are given in Cushny's laboratory book.

LES PRODUITS PHARMACEUTIQUES INDUSTRIELS. Par P. Carre, Docteur es Sciences, Préparateur à l'Institut de chèmie appliquée de Paris. Tome I et II. Paris: Octave Doin et Fils, Editeurs. 8, Place de L'Odéon, 8. 1909.

This is a valuable laboratory book for the preparation of pharmaceutical products. Volume I is devoted to the consideration of inorganic compounds, while Volume II is devoted to organic products. It has been developed along the lines of many of the books on the making of organic preparations which are used in colleges and universities. To attempt to enumerate the substances which are considered would be to mention every important product that is used in pharmacy and medicine. It is a particularly welcome work at this time, as many of the standard works used in this country are deficient in manufacturing processes, and the retail pharmacist is seeking just such information as is found in these volumes. It is indeed encouraging with the awakened interest in pharmaceutical chemistry for a work like Carre's to appear, which is both practical and complete.

FERMENTS AND THEIR ACTION. By Carl Oppenheimer. Translated from the German by C. Ainsworth Mitchell. London: Charles Griffin & Co., Limited.

This is probably the most valuable laboratory manual on the enzymes and organized ferments that has been published, as the references to the literature are very complete and the selections admirably made.

In the general part are chapters on the history of ferments; defi-

nition of the conception of a ferment; the chemical nature of ferments; the influence of external factors upon ferments; the mode of action of ferments; the physiological action of ferments; the secretion of ferments, and the importance of the ferments to vital processes.

In the special part are chapters treating of the proteolytic ferments; trypsin; bacteriolytic and hæmolytic ferments; proteolytic vegetable ferments; coagulating ferments; the saccharifying ferments; animal diastases; ferments of the polysaccharids resembling diastase; enzymes of the disaccharids; ferments which decompose glucosides; other hydrolytic ferments; the lactic acid fermentation; alcoholic fermentation; the biology of alcoholic fermentation; the oxydases; and oxidizing fermentations.

A subject index, an index of authors, and a systematic bibliography complete this welcome addition to the literature of this subject.

FORMULAIRE DES MEDICAMENTS NOUVEAUX. Par H. Bocquillon-Limousin. Avec une introduction par Henri Huchard. 21 me édition revue, corrigée et augmentée. Paris: Librairie J. B. Baillière et Fils. 19, me, rue Hautefeuille près du Boulevard Saint Germain. 1909.

In this excellent work are found a number of important additions of which the following may be mentioned; acoine, æsco-quinine, almatéine, alsol, ammonium benzoate, anisotheobromine. arsenogene, chlorhydrate of arterenol, asquirrol, autane, bacillol, bromocolle, bromethylate of morphine, bromotane, bibrom-behenate of calcium, iodate of calcium, camphosal, carosuccin, coryloform, coryphine, dyspeptine, estone, *Euphorbia peplus,* fluoroform, formestone, formicine, formidine, fulgural, guaiac-saponin, gallogene, glyconic acid, griserine, hetraline, chlorhydrate of homonerone, hydroxycaffeine, iatrevine, ichtyolidine, iodocol, iodomenine, salolophosphate of lithium, lysane, lysosulfol, metal, neoform, neusidonal, nizine, paralysol, pyroiodone, pyrolignic acid, quietol, rotra, salocresol, choleinate of sodium, sodonaphtyl, sulfogenol, sulfopyrine, sullacetine, tachiol, tannobromine, tannothymal, tannyl, thaolaxine, thiodine, thymotal, tuberculin C. L., urogosane, vasenol and viscosal.

REVUE DES MEDICAMENTS NOUVEAUX ET DE QUELQUES MÉDICATIONS NOUVELLES. Par C. Crinon. 16 me edition. Revue et aug-

mentée. Paris: Vigot Frères, Editeurs. 23, Place de l'École-de-Médecine. 1909.

In this the sixteenth edition of Crinon's valuable work on newer additions to medicine and pharmacy will be found information on allosan, arsacetine, asyphil, bromethylate of morphine, camphosal, diplosal, eucerine, euphylline, metallic ferments, helkomine, hydropyrine, iodomenine, neoform, nitrite of sodium, paratoxine, sabromine, serum marin, and sodophtalyl. Some additional information is also given concerning: apiol, kephir, koumyss, salts of lithium, lobelia, maté, myrtol, guarana, phosphide of zinc, podophyllin, etc.

DRUGGISTS' AND DISPENSERS' PRACTICAL SHOW CARD INSTRUCTOR. Published by W. A. Thompson, Pontiac, Michigan.

As stated in the preface "the object of this treatise is to give a practical course of instruction in lettering and designing necessary for making all styles of show cards and price tickets required by the pharmacist."

THE MEETING OF THE AMERICAN MEDICAL ASSOCIATION.*

In years to come the Sixtieth Annual Meeting of the American Medical Association, held in Atlantic City, June 8-11, 1909, will be looked back to as inaugurating a new era in the progress of the science of medicine. Seldom have preventative and curative measures received such thoroughgoing consideration, and seldom indeed have so many medical men jointly agreed upon the need for devoting more care and attention to the development of these all-important factors in the practice of medicine.

In connection with the discussion of curative methods it may be said that seldom has so much attention been paid to the development of the National Pharmacopœia as this year. Special committees on the Pharmacopœia reported, in the Section on Practice of Medicine, the Section on Stomatology, and the Section on Ophthalmology. The Pharmacopœia was also considered at some length in the proceedings of some of the other sections, notably in the Section on Cutaneous Medicine and Surgery, where the chair-

* Abstract of Report.—EDITOR.

man, Dr. William Allen Pusey, discussed the relations between dermatology and the Pharmacopœia.

Mr. Geo. M. Beringer, as chairman of the delegates of the American Pharmaceutical Association, presented the felicitations of the members of that organization and pointed out how members of the Section on Pharmacology and Therapeutics might be of service in the revising of the National Formulary and thus promoting the progress of the sciences relating to pharmacy. At a subsequent meeting the recommendations made by Mr. Beringer were considered and, on motion, the incoming chairman of the section was requested to appoint a committee of five to consider the National Formulary and the advisability of retaining or deleting the several preparations now included in that book.

Both of the sessions on Thursday, June 10, 1909, were devoted to the discussion of problems relating to the Pharmacopœia and National Formulary and pages of this JOURNAL would be required to adequately reflect all of the interesting material that was presented. The report of the A. M. A. committee on the United States Pharmacopœia included a review of the several lines along which medical organizations are preparing to take an active part in the coming revision of that book and outlined a plan for correlating these several lines of activity in a practical way, and thus promote the work and avoid unnecessary duplication.

C. S. N. Hallberg, Chicago, presented an interesting communication on additions to and eliminations from the Pharmacopœia of the United States from the viewpoints of statistics. Another communication bearing on the same subject was a discussion of some of the preparations of the United States Pharmacopœia from the practitioner's standpoint, by M. H. Fussell, Philadelphia.

L. F. Kebler, Washington, discussed the nomenclature of the United States Pharmacopœia and National Formulary mixtures and also presented a communication on the nature of preparations used in the treatment of drug addictions.

A paper by Henry Leffmann, Philadelphia, on "What can Physicians do to Improve the Pharmacopœia," brought out the assertion, by one of the members present, that the writer of the paper had on two occasions been nominated as a delegate to the national convention and had failed to attend the meeting. The critic of the paper pointed out that physicians could do much to improve the Pharmacopœia if they would carefully consider its needs and short-

comings, attend the decennial convention and there present their suggestions, and then see to it that they are embodied in the book by the Committee of Revision.

On the recommendation of the Committee on Awards in the Scientific Exhibit, consisting of Drs. Barker, Mayo, and Christian. the House of Delegates of the A. M. A. awarded to the American Pharmaceutical Association "a diploma of merit for exhibits of superior merit" for the exhibition of official drugs and preparations held under the auspices of the Philadelphia Branch of the American Pharmaceutical Association. In this connection some reference should be made to the very interesting meeting held by the Philadelphia Branch of the American Pharmaceutical Association in connection with this exhibition. This meeting was held on the morning of Friday, June 11, and was virtually a symposium on the U. S. P., N. F., and N. N. R. The first paper presented, "The U. S. P. and N. F. Preparations *versus* Nostrums," by Otto Raubenheimer, of Brooklyn, N. Y., contains a fund of information on the origin and evolution of pharmaceutical preparations and should, and no doubt will, be made available to every pharmacist who is at all desirous of advancing the status of his calling.

H. P. Hynson, Baltimore, presented a communication on the "More Radical Revision of the Pharmacopœia," in which he recommended that all compound U. S. P. pharmaceutical preparations be relegated to the National Formulary. M. I. Wilbert, Washington, discussed the relation of the N. N. R. to the U. S. P. W. L. Cliffe read a paper by Geo. M. Beringer, Camden, on improvements in the N. F. I. V. S. Stanilaus, Philadelphia, discussed the tests of the U. S. P., and Jos. P. Remington outlined some of the possibilities of the ninth revision of the U. S. P.

The attendance at the meeting was unexpectedly good, representing members of the American Pharmaceutical Association from Brooklyn, New York, Philadelphia, Atlantic City, Baltimore, and Washington, and the general result was particularly gratifying, considering the late date on which the meeting was organized. It should prove a stimulus for future efforts along the same line, and, in connection with the sessions of the Section on Pharmacology and Therapeutics, such meetings should do much to demonstrate the possibilities in connection with a national development of the sciences relating to pharmacy.

M. I. WILBERT.